REMARKS/ARGUMENTS

By this Amendment, claims 28 and 38 are amended. Claim 39 is added. Claim 11 is cancelled. Claims 1-3, 5-6, 9, 10, 13-28 and 37-39 are pending.

Favorable reconsideration is respectfully requested in view of the foregoing amendments and the following remarks.

The Examiner objects that claim 11 cannot depend upon claim 1 because it is not taught in the specification that the algorithms claimed by the two claims can be used at the same time. Accordingly, claim 11 has been cancelled.

The Examiner sets forth that Claim 13-26 and 37 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. According to the Examiner the claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

As to claims 13, 14 and 37, the Examiner believes that Applicants, in invention's disclosure, fail to disclose how the scatterer coefficients are <u>used for receiving</u> the associate user data, in a way to enable one skilled in the art to use the same method.

Enablement for this feature is described below.

As to claims 28 and 38, the Examiner believes that Applicant, in invention's disclosure, fails to disclose how the <u>maximum number of scatterer coefficients</u> is adapted, in a way to enable one skilled in the art to use the same method.

According to the Examiner, based on the invention's disclosure there is always three scattering coefficients (attenuation, delay and Doppler frequency) and the Examiner was not able to find any teaching in the specification that this number (3) can be adaptively changed.

Accordingly, claims 28 and 38 have been amended to recite "wherein a dimension of a scatterer matrix to be included in an algorithm is adapted..." Enablement for this change can be found in Paragraph [0053] of the Applicants' specification, which sets forth "...the dimension of the scatterer matrix can be increased adaptively..."

Furthermore, <u>since claim 38 is not rejected over prior art it is now believed to be allowable</u>.

The Examiner sets forth that Claims 1 and 3, are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. ("Generation of scattering functions by computer simulation for mobile communication channels", Vehicular Technology Conference, 1996. 'Mobile Technology for the Human Race'. IEEE 46th; Publication Date: 28 Apr-1 May 1996, Volume: 3,

On page(s):1443-1447 vol.3.), and Wiedeman et al. (hereafter, referred as Wiedeman) (US 5,796,760), and Chabah et al. (hereafter, referred as Chabah) (US 6,310,575) and further in view of Filimon.

As to claim 1, the Examiner sets forth that Wang discloses a data signal transmitted via a time-variant channel to a receiver (the Examiner directs the Applicant's attention to page 1443), wherein scatter coefficients including attenuation (the Examiner directs the Applicant's attention to page 1444, left column), delay and Doppler frequency (the Examiner directs the Applicant's attention to page 1444, right column) in the received data signal, which cause signal distortion in the channel, are measured in the receiver (the Examiner directs the Applicant's attention to pages 1443 and 1444). According to the Examiner although Wang does not disclose that the signal is transmitted using a single-carrier or multi-carrier, in order to transmit the signals from transmitter to the receiver, inherently, there must be at least one carrier (single carrier).

The Examiner believes that Wang discloses all the subject matters claimed in claim 1, except that the data signal is equalized with the scatterer coefficients and then demodulated with them, and that Wang also does not disclose that the scatterer coefficients are measured via a maximum likelihood criterion and wherein a recursive least square algorithm is used iteratively for the measurement of the scatterer coefficient. As to the first limitation, the Examiner believes that Wiedeman discloses a receiver apparatus comprising an equalizer and a demodulator, wherein the equalizer equalizes a Doppler frequency offset (interpreted by the Examiner as the first scatterer coefficient) for each correlated signal and the delay (interpreted by the Examiner as

the second scatterer coefficient) of each of the correlated signals (the Examiner directs the Applicant's attention to column 15, last paragraph).

The Examiner further believes that Wiedeman further discloses that the receiver includes circuitry for combining together all equalized correlated signals to provide a demodulator with a composite received signal (the Examiner directs the Applicant's attention to column 15, last paragraph). According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang as suggested by Wiedeman in order to transmit the majority of the signal over the communication path (or paths) which are capable of conveying a highest quality signal (the Examiner directs the Applicant's attention to column 16, first paragraph) and as the result increases the performance of the receiver.

The Examiner believes that Wang and Wiedemann disclose all the subject matters claimed in claim 1, except that the scatterer coefficients are measured via a maximum likelihood criterion, wherein a recursive least square algorithm is used iteratively for the measurement of the scatterer coefficient according to the Examiner. The Examiner believes that Chabah discloses a method for estimating Doppler frequency (the Examiner directs the Applicant's attention to column 4, lines 37-43), and that Chabah further discloses that the Doppler frequency (interpreted by the Examiner as Scatterer coefficients) is estimated for each candidate according to the known criterion of generalized maximum likelihood. According to the Examiner it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang and Wiedeman as suggested by Chabah to provide a fast and accurate estimation for Doppler

frequency.

Thus, the Examiner believes that Wang, Wiedemann and Chabah disclose all the subject matters claimed in claim 1, except that a recursive least square algorithm is used iteratively for the measurement of the scatterer coefficient. The Examiner further believes that Filimon, in the same field of endeavor, defines a scattering function according to Doppler frequency and time delay coefficients (the Examiner directs the Applicant's attention to page 349, left column). Accordingly, the Examiner believes that Filimon discloses that the coefficients can be measured by using a recursive least square algorithm iteratively (the Examiner directs the Applicant's attention to page 349, right column, $G_{rls}(\theta)$ and formula 11). Since the Examiner believes that Recursive Least Square (RLS) algorithms are known for having high convergence speed and high estimation accuracy, it would have been obvious to one of ordinary skill in the art at the time of the invention to use RLS algorithm for measuring the scattering coefficients for the reasons stated above according to the Examiner.

New claim 39 recites a method for equalizing and demodulating a data signal transmitted using a single-carrier or multi-carrier data-transmission procedure via a time-variant channel to a receiver, wherein scatterer coefficients including attenuation, delay and Doppler frequency in the received data signal, which cause signal distortion in the channel, are measured in the receiver to provide measured scatterer coefficients, and the data signal is equalized with the measured scatterer coefficients determined in this manner and then demodulated with the measured scatterer coefficients (emphasis added).

The Examiner's attention is drawn to the fact that new claim 39 affirmatively requires measuring the scatterer coefficients in the receiver to provide measured scatterer coefficients. New claim 39 also affirmatively requires that the measured scatterer coefficients are used to equalize and demodulate the data signal. Thus, in the invention of new claim 39, the data signal is not equalized or demodulated using the impulse response.

Accordingly, it is important that the Examiner make this distinction. In the Applicants' invention the data signal is equalized and demodulated using the scatterer coefficients. The data signals are not equalized and demodulated using the impulse response. The Applicants submit that this significant feature of the Applicants' invention is clearly not taught by Wiedemann, or by any of the other references cited by the Examiner. The cited references teach equalizing and demodulating using the impulse response, not using the scatterer coefficient.

Claim 1 also requires the novel and unobvious feature wherein the scatterer coefficients are used to equalize and demodulate the data signal. Therefore, both claims 1 and 39 are believed to be allowable.

Enablement for using the scatterer coefficients to equalize and demodulate the data signal can be found as follows.

Beginning at Paragraph [0020] of the Applicants' specification, the Applicant does teach

estimating the impulse response. However, beginning at Paragraph [0023], the Applicant

discloses determining the scatterer coefficients. In particular, Paragraph [0027] sets forth: "The

data symbols ... are determined from the signal received using the method set forth below"

(emphasis added). The following Paragraphs [0028] – [0035] thus referred to teach determining

the scatterer coefficients. According to these teachings, for example, the scatterer coefficients

are preferably estimated in the time domain and the estimation is carried out over N samples.

Further teachings regarding the determination of the scatterer coefficients follow,

including the use of a recursive Kalman algorithm at Paragraph [0037]. In Paragraphs [0043]-

[0044] the procedure taught in Paragraphs [0023] *et seq.* are described as a tree search procedure.

Specifically, in Paragraph [0043] reference is made to (2) and/or (3), and Paragraph [0044]

recites "This tree-search procedure is illustrated in Fig. 2..." Paragraph [0049] sets forth that the

foregoing "combination provides combined channel estimation, equalization, demodulation and

decoding.

Thus, the Applicants have fully enabled the claimed feature wherein the measured

scatterer coefficients are used to equalize and demodulate the data signal.

Furthermore, the Applicants submit that these operations comprise "receiving the

associated user data" as recited in claims 13-26 and 37. Since claim 37 is not rejected over prior

art, it is believed to be allowable.

The Wiedemann reference cited by the Examiner describes the so called rake-receiver which includes multiple channels. In the description disclosed by Wiedemann in column 7, line 57 and the end of column 15, all paths are assumed to be constant and therefore all the output signals can be combined. This combiner of Wiedemann is thus a so called maximum ratio combiner. There is no teaching or suggestion in Tiedemann's combiner that a receiver receiving data signal transmitted via a single carrier of a multi-carrier date-transmission on a time-variant channel can use the scatterer-coefficients for equalizing and demodulating the received data signal as recited in the Applicants' invention.

The remaining claims depend either directly or indirectly from the foregoing allowable claims and are therefore also allowable for at least the same reasons.

For at least the reasons set forth above, it is respectfully submitted that the above-identified application is in condition for allowance. Favorable reconsideration and prompt allowance of the claims are respectfully requested.

Should the Examiner believe that anything further is desirable in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Application No. 10/518,183
Amendment Dated April 9, 2009
Reply to Office Action of January 9, 2009

Respectfully submitted,

CAESAR, RIVISE, BERNSTEIN,
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April 9, 2009

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